

WHAT IS CLAIMED IS:

- 1           1.           A method of transmitting a network packet from a source node to a destination node,  
2 wherein the source and destination nodes are coupled to a fault tolerant storage system (FTSS)  
3 via an FTSS interconnection fabric, the method comprising:  
4           transmitting the packet from the source node to the FTSS via the FTSS  
5           interconnection fabric;  
6           storing the packet in highly reliable fault-tolerant storage media of the FTSS; and  
7           transmitting the packet from the FTSS to the destination node via the FTSS  
8           interconnection fabric.
- 1           2.           The method of claim 1 and further comprising:  
2           sending an acknowledgment from the FTSS to the source node guaranteeing delivery  
3           of the packet to the destination node.
- 1           3.           The method of claim 1 and further comprising:  
2           sending an acknowledgment from the destination node to the FTSS acknowledging  
3           receipt of the packet at the destination node.
- 1           4.           The method of claim 1 and further comprising:  
2           deleting the packet from the highly reliable fault-tolerant storage media after the  
3           packet has been transmitted to the destination node.
- 1           5.           The method of claim 1 and further comprising:  
2           retaining the packet in a packet queue of the FTSS for a period of time after the  
3           packet has been transmitted to the destination node.

1           6.           The method of claim 1 wherein the packet is transmitted from the source node to the  
2           FTSS, and from the FTSS to the destination node as a file I/O transaction.

1           7.           The method of claim 1 wherein the packet is transmitted from the source node to the  
2           FTSS, and from the FTSS to the destination node by encapsulating the packet in a protocol of  
3           an interface used to implement the FTSS interconnection fabric.

1           8.           The method of claim 1 wherein storing the packet in highly reliable fault-tolerant  
2           storage media of the FTSS comprises storing the packet in a nonvolatile write cache of the  
3           FTSS.

1           9.           The method of claim 1 wherein storing the packet in highly reliable fault-tolerant  
2           storage media of the FTSS comprises storing the packet in a redundant array of independent  
3           disks of the FTSS.

1           10.          A method of transmitting a network packet from a source node to a destination node,  
2           wherein the source node is coupled to a fault tolerant storage system (FTSS) via an FTSS  
3           interconnection fabric, and the destination node is coupled to the FTSS via an external network,  
4           the method comprising:

5                   transmitting the packet from the source node to the FTSS via the FTSS  
6                   interconnection fabric;

7                   storing the packet in highly reliable fault-tolerant storage media of the FTSS; and  
8                   transmitting the packet from the FTSS to the destination node via the external  
9                   network.

1 11. The method of claim 10 and further comprising:  
2 sending an acknowledgment from the FTSS to the source node acknowledging that  
3 the FTSS has received the packet, but delivery of the packet to the destination  
4 node will be attempted but can not be guaranteed.

1 12. The method of claim 10 and further comprising:  
2 deleting the packet from the highly reliable fault-tolerant storage media after the  
3 packet has been transmitted to the destination node.

1 13. The method of claim 10 wherein the packet is transmitted from the source node to  
2 the FTSS as a file I/O transaction.

1 14. The method of claim 10 wherein the packet is transmitted from the source node to  
2 the FTSS by encapsulating the packet in a protocol of an interface used to implement the FTSS  
3 interconnection fabric.

1 15. The method of claim 10 wherein storing the packet in highly reliable fault-tolerant  
2 storage media of the FTSS comprises storing the packet in a nonvolatile write cache of the  
3 FTSS.

1 16. The method of claim 10 wherein storing the packet in highly reliable fault-tolerant  
2 storage media of the FTSS comprises storing the packet in a redundant array of independent  
3 disks of the FTSS.

1 17. A method of transmitting a network packet from a source node to a destination node,  
2 wherein the destination nodes is coupled to a fault tolerant storage system (FTSS) via an FTSS

interconnection fabric, and the source node is coupled to the FTSS via an external network, the method comprising:

transmitting the packet from the source node to the FTSS via the external network;  
storing the packet in highly reliable fault-tolerant storage media of the FTSS; and  
transmitting the packet from the FTSS to the destination node via the FTSS  
interconnection fabric.

18. The method of claim 17 and further comprising:

sending an acknowledgment from the destination node to the FTSS acknowledging  
receipt of the packet at the destination node.

19. The method of claim 17 and further comprising:

deleting the packet from the highly reliable fault-tolerant storage media after the  
packet has been transmitted to the destination node.

20. The method of claim 17 and further comprising:

retaining the packet in a packet queue of the FTSS for a period of time after the  
packet has been transmitted to the destination node.

21. The method of claim 17 wherein the packet is transmitted from the FTSS to the  
destination node as a file I/O transaction.

22. The method of claim 17 wherein the packet is transmitted from the FTSS to the  
destination node by encapsulating the packet in a protocol of an interface used to implement the  
FTSS interconnection fabric.

1        23.        The method of claim 17 wherein storing the packet in highly reliable fault-tolerant  
2 storage media of the FTSS comprises storing the packet in a nonvolatile write cache of the  
3 FTSS.

1        24.        The method of claim 17 wherein storing the packet in highly reliable fault-tolerant  
2 storage media of the FTSS comprises storing the packet in a redundant array of independent  
3 disks of the FTSS.

1        25.        A networked system comprising:  
2 a plurality of nodes;  
3 a fault tolerant storage system (FTSS); and  
4 an FTSS interconnection fabric coupling the plurality of nodes to the FTSS;  
5 wherein each node includes:  
6 a network protocol stack for processing network I/O;  
7 an interface for sending data to and receiving data from the FTSS  
8 interconnection fabric; and  
9 a packet conversion unit for linking the network protocol stack, thereby  
10 allowing network traffic to flow between the node and the FTSS via  
11 the FTSS interconnection fabric;  
12 and wherein the FTSS includes:  
13 nonvolatile fault-tolerant storage media for storing data;  
14 a file operations unit for completing file I/O operations to the nonvolatile fault  
15 tolerant storage media; and  
16 a network routing agent for receiving packets from source nodes of the  
17 plurality of nodes, storing packets in the nonvolatile fault-tolerant  
18 storage media, and transmitting packets to destination nodes of the  
19 plurality of nodes.

1 26. The networked system of claim 25 wherein the network routing agent of the FTSS  
2 sends an acknowledgment to the packet conversion unit of the source node guaranteeing  
3 delivery of the packet to the destination node.

1 27. The networked system of claim 25 wherein the packet conversion unit of the  
2 destination node sends an acknowledgment to the networking routing agent of the FTSS  
3 acknowledging receipt of the packet at the destination node.

1 28. The networked system of claim 25 wherein the network routing agent of the FTSS  
2 deletes the packet from the nonvolatile fault-tolerant storage media of the FTSS after the packet  
3 has been transmitted to the destination node.

1 29. The networked system of claim 25 wherein the network routing agent of the FTSS  
2 retains the packet in a packet queue stored on the nonvolatile fault-tolerant storage media for  
3 a period of time after the packet has been transmitted to the destination node.

1 30. The networked system of claim 25 wherein packets are transmitted from source nodes  
2 to the FTSS, and from the FTSS to the destination nodes as file I/O transactions.

1 31. The networked system of claim 25 wherein packets are transmitted from source nodes  
2 to the FTSS, and from the FTSS to the destination nodes by encapsulating packets in a protocol  
3 of an interface used to implement the FTSS interconnection fabric.

1 32. The networked system of claim 25 wherein the nonvolatile fault-tolerant storage  
2 media of the FTSS includes a nonvolatile write cache.

1 33. The networked system of claim 25 wherein the nonvolatile fault-tolerant storage  
2 media of the FTSS comprises a redundant array of independent disks.

1 34. The networked system of claim 25 and further comprising an external network  
2 coupled to the FTSS, wherein the FTSS routes packets between the plurality of nodes coupled  
3 to the FTSS, and external nodes coupled to the external network.

1 35. A server comprising:  
2 a plurality of applications and system utilities;  
3 an interface for coupling the server to a fault tolerant storage system (FTSS); and  
4 I/O system services coupled between the plurality of applications and system utilities  
5 and the interface, the I/O system services including:  
6 a file system for processing file I/O operations between the plurality of  
7 applications and system utilities and an FTSS via the interface; and  
8 a network protocol stack for processing network packets between the plurality  
9 of applications system and utilities and other network nodes; wherein  
10 the network protocol stack links into the file system to carry network  
11 packets to an FTSS via the interface.

1 36. A fault tolerant storage system (FTSS) comprising:  
2 nonvolatile fault-tolerant storage media for storing data;  
3 a file operations unit for completing file I/O operations to the nonvolatile fault  
4 tolerant storage media; and  
5 a network routing agent for receiving packets from source nodes coupled to the FTSS  
6 via an FTSS interconnection fabric, storing packets in the nonvolatile fault-

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